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XLII—RESEARCHES ON SILENE MARITIMA AND S. VULGARIS: XVI.*

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THE RESULTS OF FURTHER INTERSPECIFIC CROSSING.

In the present paper we describe the results obtained by crossing a stock-plant of *S. vulgaris* (B.11) with three different plants of *S. maritima* (A.2, A.5, A.15). These stock-plants have already been described: A.2, in K.B. 1928, 4 and K.B. 1933, plate 14; A.5, in K.B. 1929, 146 and K.B. 1933, plate 15; A.15 in K.B. 1929, 151, plate 7; B.11, in K.B. 1931, 121, plate 12. The crosses were made mainly for the purposes of studying the genetical behaviour of indumentum, sex, and leaf shape in interspecific crossing. No hairy varieties of wild *S. maritima* have ever been seen by us. Various statistics for the occurrence of hairy varieties in wild populations of *S. vulgaris* have been published in K.B. 1931, No. 3, and we have also a mass of unpublished data concerning many other wild populations of both species.

The following crosses and selfings were made:

N. 40. A.15 × B.11.
- N. 79 = N. 40.7 selfed
- N. 91 = N. 40.7 selfed
- N. 92 = N. 40.4 selfed
- N.100 = N. 40.3 selfed

N. 42. A.2 × B.11.
- N. 93 = N. 42.13 selfed

N. 52. B.11 × A.5.
- N. 83 = N. 52.1 selfed
- N. 78 = N. 52.2 selfed
- N. 88 = N. 52.2 selfed

In the descriptions and analyses which follow, the following points should be noted:

(1) The scoring for presence or absence of barren stems was made in the winter (15.12.1934). As explained in earlier papers of this series *S. vulgaris* is typically hemicryptophytic, the flowering shoots dying back right to ground level, while *S. maritima* is typically chamaephytic, green "barren" shoots being present all the year through. The term "intermediate" is used for plants retaining through the winter a few green barren shoots, usually situated near the base of old flowering stems.

(2) In the F_1 and F_2 families between B.11 and *S. maritima* the hairs are frequently much shorter than in hairy plants of British *S. vulgaris* and especially than in B.11. In scoring for indumentum

*Continued from K.B. 1935, 219.

only the density of the hairs has been considered in this paper. There is a tendency for the hairs to be denser on the leaves than on the stems. When a difference was noted the scoring used is based on stem indumentum.

(3) In scoring for leaves the symbols M, HM, MH, H, VH, HV, V were used as in the first paper of this series (K.B. 1928, 11) except that it must be remembered that their values are constant only for families and generations involving the same stock-plants. Thus H may mean in this paper broader or narrower leaves according to the *S. maritima* parent used.

Selfings.

N. 74. B.11 selfed. Several selfings were made but only one plant was raised from the meagre seed obtained. This was largely due to *Marssonina* attack. The one plant closely resembled its parent. It had medium anthocyanin in the vegetative parts and a little in the calyx. The leaves were somewhat smaller. Inflorescence with up to 50 flowers. Petals lobed $\frac{3}{4}$; boss; petals and segments not contiguous or overlapping. Filaments white, anthers purple. Stigmata white, immature seeds white. The only point of scored difference from the parent is the appearance of white filaments, indicating that the parent was heterozygous for this character.

N. 14. S.–P. 5 was selfed and produced a family of 40 plants. The family was uniform and like the parent in habit, leaves, inflorescence, calyx, corona, presence of anthocyanin blotch, filaments, stigmata, immature seeds, capsules and mature seeds. All plants produced fully developed petals and hermaphrodite flowers.

N. 17. S.–P. 15 was selfed and produced a family of 36 plants. The family was uniform and like the parent in habit, leaves, inflorescence, calyx, lobing of petals and overlapping of petals and segments, corona, presence of anthocyanin blotch, filaments purple, immature seeds, capsules, and mature seeds. Segregation occurred for (1) degree of anthocyanin development in vegetative parts and calyx—10 very much : 26 much, (2) stigmata colour—18 purple : 15 white, (3) sex—25 hermaphrodite : 8 female.

Interspecific Crosses.

N. 40. = A.15 × B.11. 30 plants in the family.

Habit: more or less spreading, and ascending, uniform, stems up to 5·2 dm. long, intermediate for barren shoots.

Indumentum: medium on stems and leaves, uniform.

Anthocyanin in vegetative parts: medium.

Leaves: varying in size on same plant and ranging from narrow lanceolate, linear-lanceolate, to linear-oblanceolate, well developed leaves 2·8 to 3·5 cm. long and 0·5–0·8 cm. broad.

Inflorescence: of from 7 to 15 flowers, all slightly nodding and slightly zygomorphic.

Calyx: medium amount of anthocyanin; subinflated, except No. 3, which was inflated.

Petals: all white; 28 bilobed : 2 multilobed; all lobed $\frac{3}{4}$;

N. 40, showing range of leaf sizes and shapes, flower parts, and portion of shoot system.

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6 with blotch : 24 with no blotch ; in all plants petals contiguous or overlapping and segments diverge ; 25 with F_1 scales : 5 with bosses.

Androecium : in all anthers purple ; filaments of all purple.

Sex : of all plants full hermaphrodite.

Gynoecium : stigmata 3 plants purple : 27 plants white ; all plants had purple immature seeds.

Mature capsules : 26 plants (all that were scorable) had F_1 capsules—except that in No. 15 the teeth fully reflexed.

Mature seeds : 27 plants (all that were scorable) had tubercled seeds.

N. 79. = N. 40·7 selfed. 9 plants in the family.

The parent (N. 40·7) had bilobed petals, with blotch, F_1 scales, and white stigmata.

Habit : stems from 2·8 dm. to 5·5 dm. long. Nos. 5 and 8 had some lower barren shoots over-wintering, i.e., they were intermediate between the parents.

Indumentum : 1 dense : 4 medium : 3 glabrous.

Anthocyanin in vegetative parts : 1 much : 8 medium.

Leaves : OM : 2HM : 3MH : 1H : 1VH : OHV : OV.

Inflorescence : of from 7 to 15 flowers

Number of flowers	7	8	15
,, ,, plants	4	1	3

Flowers all zygomorphic and nodding, even if only slightly.

Calyx: in all medium anthocyanin ; in all subinflated.

Petals: all white ; in all bilobed ; all lobed $\frac{3}{4}$; 6 with : 3 without blotch ; in all petals and segments not contiguous or overlapping ; in all bosses.

Androecium: anthers in 4 purple ; filaments in 4 purple.

Sex: 1 with hermaphrodite flowers only : 3 with hermaphrodite and female flowers : 5 with female flowers only.

Gynoecium: stigmata of all white ; immature seeds of all purple.

Mature capsules: 5 F_1 : 3 *vulgaris* type.

Mature seeds: 5 tubercled : 2 armadillo.

N. 91. = N. 40·7 selfed. 64 plants in the family.

The parent (N. 40·7) had bilobed petals, with blotch, F_1 scales, and white stigmata.

Habit: 24 spreading : 40 compact ; 8 prostrate : 56 ascending ; stems from 1·0 dm. up to 5·6 dm. long ; 26 barren stems fully present : 31 intermediate : 6 barren stems absent.

Indumentum: 24 dense : 23 medium : 3 few : 14 glabrous.

Anthocyanin in vegetative parts: 10 much : 48 medium : 6 little.

Leaves: 5M : 17HM : 21MH : 15H : 6VH : 0HV : 0V.

Inflorescence: of from 3 to 26 flowers.

Number of flowers	3	4	5	6	7	8	9	10	11	12	15	19	23
,, ,, plants	1	1	1	3	26	1	2	3	2	1	18	1	1

Flowers all zygomorphic and nodding, even if only slightly.

Calyx: 2 much anthocyanin : 53 medium anthocyanin : 6 little anthocyanin ; 2 inflated : 51 subinflated : 8 narrow.

Petals: all white ; all bilobed except multilobed in No. 13 ; 57 lobed $\frac{3}{4}$: 14 lobed $\frac{2}{3}$; 30 blotch present : 31 blotch absent ; petals and segments not overlapping or contiguous in 60 plants, in No. 26 petals and segments overlapping ; 3 plants F_1 scales : 58 bosses.

Androecium: anthers 26 purple (all that were scorable) ; filaments 22 purple : 4 white.

Sex: 19 with hermaphrodite flowers only : 7 with hermaphrodite and female flowers : 35 with female flowers only.

Gynoecium: 4 plants with purple stigmata : 57 plants with white stigmata ; 57 immature seeds purple : 2 white.

Mature capsules: 54 F_1 : 3 *vulgaris* type.

Mature seeds: 16 armadillo : 39 tubercled.

N. 92. = N. 40·4 selfed. 91 plants in the family.

The parent (N. 40·4) had bilobed petals, with no blotch, bosses, and white stigmata.

Habit: 65 spreading : 26 compact ; 35 prostrate : 56 ascending ; stems from 2·2 dm. up to 6·0 dm. long ; 12 barren stems fully present : 35 intermediate : 44 barren stems absent.

Indumentum: 23 dense : 30 medium : 12 few : 26 glabrous.

Anthocyanin in vegetative parts: 11 much : 52 medium : 28 little.

Leaves: 5M : 45HM : 30MH : 5H : 3VH : 3HV : 0V.

Inflorescence: of from 5 to 29 flowers.

Number of flowers	5	6	7	8	9	10	11	12	13	14	15	16	17	22	23	27	28	29
,, ,, plants	1	2	17	1	10	3	5	7	13	9	14	2	1	1	1	1	1	1

Flowers all zygomorphic and nodding, even if only slightly.

Calyx: 1 much anthocyanin : 34 medium anthocyanin : 51 little anthocyanin : 4 no anthocyanin ; 2 inflated : 88 subinflated.

Petals: all white ; 88 bilobed : 2 multilobed ; 82 lobed $\frac{3}{4}$: 8 lobed $\frac{2}{3}$; 27 blotch present : 63 blotch absent ; petals 23 contiguous or overlapping : 67 not contiguous or overlapping ; segments 11 contiguous or overlapping : 79 not contiguous or overlapping ; 2 plants F_1 scales : 88 bosses.

Androecium: anthers 67 purple (all in which anthers scorable) ; filaments 48 purple : 19 white.

Sex: 60 with hermaphrodite flowers only : 7 with hermaphrodite and female flowers : 23 with female flowers only.

Gynoecium: 1 with purple stigmata : 89 with white stigmata ; 78 immature seeds purple : 11 white.

Mature capsules: 56 F_1 : 19 *vulgaris* type.

Mature seeds: 17 armadillo : 58 tubercled.

N. 100. = N. 40·3. selfed. 12 plants in the family.

The parent (N. 40·3) had inflated calyx, bilobed petals, with no blotch, F_1 scales, and white stigmata.

Habit: 6 spreading : 6 compact ; 2 prostrate : 10 ascending ; stems from 2·5 dm. up to 6·5 dm. long ; 3 barren stems fully present : 6 intermediate : 3 barren shoots absent.

Indumentum: 4 dense : 3 medium : 3 few : 2 glabrous.

Anthocyanin in vegetative parts: 10 medium : 2 little.
Leaves: 1M : 3HM : 2MH : 5H : 0VH : 1HV : 0V.
Inflorescence: of from 7 to 53 flowers.

Number of flowers	7	15	17	26	33	53
,, ,, plants	1	7	1	1	1	1

Flowers all zygomorphic and nodding, even if only slightly.
Calyx: 4 medium anthocyanin : 8 little anthocyanin ; 1 inflated : 11 subinflated.
Petals: all white ; 10 bilobed : 2 multilobed ; all lobed $\frac{3}{4}$; in all no blotch ; in all petals and segments not contiguous or overlapping ; 1 scales : 10 F_1 scales : 1 boss.
Anthroecium: anthers in 10 purple (i.e. in all hermaphrodites) ; filaments 5 purple : 5 white.
Sex: 9 with hermaphrodite flowers only : 1 with hermaphrodite and female flowers : 2 with female flowers only.
Gynoecium: stigmata of all white ; immature seeds of all purple.
Mature capsules: 4 F_1 : 2 *vulgaris* type.
Mature seeds: 6 tubercled (all that were scorable).
Many of the plants of this family produced very little seed.

N. 42. = A.2 × B.11. 47 plants in the family.
Habit: compact and ascending, uniform, stems up to 5 dm. long, intermediate for barren stems.
Indumentum: medium on stems and leaves, uniform.
Anthocyanin in vegetative parts: little.
Leaves: varying on same plant and ranging from lanceolate, oblanceolate, to elliptic-lanceolate, in shape tending towards the *S. vulgaris* parent, well developed leaves 2·5 to 4·2 cm. long and 0·8–1·3 cm. broad.
Inflorescence: of from 7 to 15 flowers, all slightly nodding and slightly zygomorphic.
Calyx: medium amount of anthocyanin ; inflated.
Petals: all white ; 39 bilobed : 8 multilobed ; all lobed $\frac{3}{4}$; in all no blotch ; in all petals and segments contiguous ; all with F_1 scales.
Androecium: in all plants scorable anthers purple ; filaments 4 purple : 7 white (hermaphrodite flowers only).
Sex: 1 plant with hermaphrodite flowers only : 13 with hermaphrodite and female flowers : 33 with female flowers only.
Gynoecium: stigmata 20 plants purple : 27 plants white. All plants had purple immature seeds.
Mature capsules: 16 plants (all that were scorable for capsules) had F_1 capsules.
Mature seeds: 12 plants (all that were scorable for mature seeds) had tubercled seeds.
The female plants set fruits and seeds very sparsely or not at all.

N. 93. = N. 42·13 selfed. 54 plants in the family.
The parent (N. 42·13) had bilobed petals, pink filaments, full hermaphrodite flowers, purplish stigmata, capsules F_1, and seeds tubercled.

Habit: 19 spreading : 35 compact ; 32 prostrate : 22 ascending. Stems from 1·1 dm. to 5·9 dm. long. All plants uniformly had a few lower barren shoots over-wintering, but no definite chamaephytes segregated out.

Indumentum: 7 dense : 19 medium : 8 few : 20 glabrous.

Anthocyanin in vegetative parts: 19 much : 30 medium : 5 little.

Leaves: 2M : 15HM : 6MH : 13H : 5VH : 10HV : 3V

Inflorescence: of from 3 to 32 flowers.

Number of flowers	3	4	7	8	9	10	11	12	13	15	16	32
,, ,, plants	2	1	14	5	4	4	4	4	5	6	3	1

All flowers showed at least a trace of zygomorphy.

Calyx: 3 much anthocyanin : 50 medium anthocyanin ; 17 inflated : 31 subinflated : 5 narrow.

Petals: all white ; 51 bilobed : 2 multilobed ; 28 lobed $\frac{3}{4}$: 23 lobed $\frac{2}{3}$: 2 lobed $\frac{1}{2}$; in all no blotch ; 29 with petals overlapping or contiguous : 23 with petals not overlapping or contiguous ; 17 with segments overlapping : 35 with segments not overlapping ; 4 scales : 30 F_1 scales : 19 bosses.

Androecium: 40 anthers purple : 3 yellow-green ; 31 filaments purple : 11 white.

Sex: 34 with hermaphrodite flowers only : 8 with hermaphrodite and female flowers : 11 with female flowers only.

Gynoecium: stigmata 43 plants purple : 8 plants white ; immature seeds 32 plants purple : 12 plants white.

Mature capsules: 20 F_1 : 12 *vulgaris* type.

Mature seeds: 20 tubercled : 8 armadillo.

Peculiar individual characters appeared in flowers as follows : No. 27 showed slight involution of the petals ; No. 28 had one petal quite entire in one flower ; No. 32 had two petals emarginate ; No. 37 had small *vulgaris* type of petals.

Many of the plants of this family produced very little seed.

N. 52. = B.11 × A.5. 6 plants in the family.

Habit: spreading and ascending, uniform, stems up to 5·5 dm. long, intermediate for barren stems.

Indumentum: medium on stems and leaves, uniform.

Anthocyanin in vegetative parts: medium.

Leaves: Nos. 1, 3, 4, 5, and 6 uniform, narrow-lanceolate to linear-lanceolate, 3·6 cm. long, 0·6 cm. broad, No. 2. lanceolate to linear-lanceolate, well developed leaf 4·6 cm. long, 1·2 cm. broad.

Inflorescence: of from 2 to 15 flowers, all slightly nodding and slightly zygomorphic.

Calyx: all with medium amount of anthocyanin ; all subinflated.

Petals: all white ; all bilobed ; all lobed $\frac{3}{4}$; all with blotch ; petals and segments not contiguous or overlapping ; all with bosses.

N. 52, plant 1, flowering specimen.

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Androecium: in all plants scorable, anthers purple ; filaments of 5 purple.

Sex: 3 with hermaphrodite flowers only : 2 with hermaphrodite and female flowers : 1 with female flowers only.

Gynoecium: stigmata 5 purple : 1 white ; all plants had purple immature seeds.

Mature capsules: in all of F_1 type.

Mature seeds: all tubercled.

N. 83. = N. 52·1 selfed. 18 plants in the family.

The immediate parent (N. 52·1) had narrow-lanceolate to linear-lanceolate leaves, hermaphrodite and female flowers, and white stigmata.

Habit: stems from 2·0 dm. to 6·7 dm. long ; 8 intermediate for over-wintering barren stems : 2 none.

Indumentum: 1 dense : 10 medium : 3 few : 4 glabrous.

Anthocyanin in vegetative parts: 4 much : 11 medium ; 3 little.

Leaves: 3M : 5HM : 5MH : 5H : 0VH : 0HV : 0V.

Inflorescences of from 3 to 23 flowers.

Number of flowers	3	7	9	15	18	23
,, ,, plants	2	7	1	6	1	1

Flowers all zygomorphic and nodding, even if only slightly.

Calyx: 5 much anthocyanin : 11 medium : 2 little ; 2 inflated : 15 subinflated : 1 narrow.

Petals: all white ; in all bilobed ; 9 lobed $\frac{3}{4}$: 9 lobed $\frac{2}{3}$; 2 with : 11 without blotch ; in all petals and segments not contiguous or overlapping ; 1 F_1 scales : 17 bosses.

Androecium: anthers and filaments purple in 3 (remainder female).

Sex: 3 with hermaphrodite flowers only : 15 with female flowers only.

Gynoecium: 14 purple : 4 white ; immature seeds 12 purple : 5 white.

Mature capsules: 8 F_1 type : 5 *vulgaris* type.

Mature seeds: 7 tubercled : 2 armadillo.

N. 78. = N. 52·2 selfed. 11 plants in the family.

The immediate parent (N. 52·2) had lanceolate to linear-lanceolate leaves, hermaphrodite flowers, and purple stigmata.

Habit: stems from 2·6 dm. to 5·7 dm. long ; in 7 plants barren shoots absent or very few.

Indumentum: 1 dense : 5 medium : 2 few : 3 glabrous.

Anthocyanin in vegetative parts: 9 medium : 2 little.

Leaves: 2M : 2HM : 6MH : 1H : 0VH : 0HV : 0V.

Inflorescence: of from 7 to 15 flowers.

Number of flowers 7|9|15
,, ,, plants 7|1| 3

Flowers all zygomorphic and nodding, even if only slightly.

Calyx: 5 medium anthocyanin : 6 little ; 10 subinflated : 1 narrow.

Petals: all white ; all bilobed ; 2 lobed $\frac{3}{4}$: 8 lobed $\frac{2}{3}$: 1 lobed $\frac{1}{2}$; 3 with blotch : 8 without blotch ; all with petals and segments not contiguous or overlapping ; 1 F_1 scales : 2 F_1 scales to bosses : 1 bosses to scales : 7 bosses.

Androecium: anthers in 9 purple (all that were scorable) ; filaments 8 purple : 1 white (remainder not scorable).

Sex: 3 with hermaphrodite flowers only : 6 with hermaphrodite and female flowers : 1 with female flowers only.

Gynoecium: stigmata all purple ; immature seeds 7 purple : 3 white.

Mature capsules: 6 F_1 type (remainder unscorable).
Mature seeds: 2 tubercled : 3 armadillo (remainder unscorable).
There was high sterility in this family.

N. 88. = N. 52·2 selfed. 65 plants in the family.

The immediate parent (N. 52·2) had lanceolate to linear-lanceolate leaves, hermaphrodite flowers, and purple stigmata.

Habit: 33 spreading : 31 compact ; 4 prostrate : 60 ascending ; stems from 1·4 dm. up to 8·5 dm. long ; 3 barren stems fully present : 24 intermediate : 31 barren stems absent.

Indumentum: 6 dense : 28 medium : 9 few : 21 glabrous :

Anthocyanin in vegetative parts: 14 much : 36 medium : 14 little.

Leaves: 5M : 20HM : 12MH : 15H : 9VH : 3HV : 0V.

Inflorescence: of from 7 to 52 flowers.

Number of flowers	7	11	12	15	16	17	20	21	22	23	29	30	31	32	33	43	52
,, plants	7	1	2	3	0	1	2	2	1	2	3	1	1	6	1	1	1

Flowers all zygomorphic and nodding, even if only slightly.

Calyx: 2 much anthocyanin : 35 medium : 25 little : 1 none : 1 inflated : 58 subinflated : 4 narrow.

Petals: all white : all bilobed ; 12 lobed $\frac{3}{4}$: 30 lobed $\frac{2}{3}$: 17 lobed $\frac{1}{2}$; 2 lobed $\frac{1}{3}$; 24 with blotch : 37 without blotch ; all with petals and segments not contiguous or overlapping, except 6 with petals and 4 with segments overlapping, and unscorable in 4 plants ; 7 with F_1 scales : 54 with bosses.

Androecium: anthers in 40 purple (all that were scorable) ; filaments 36 purple : 5 white.

Sex: 14 with hermaphrodite flowers only : 25 with hermaphrodite and female flowers : 22 with female flowers only.

Gynoecium: stigmata 42 purple : 9 white; immature seeds 44 purple : 11 white.

Mature capsules: 24 F_1 : 6 *vulgaris* type.

Mature seeds: 20 tubercled : 7 armadillo.

There was a high degree of sterility in this family as shown by the incomplete setting of fruits and seeds.

DISCUSSION.

All the families dealt with in this paper originated from crosses between *S. vulgaris* and *S. maritima*. The characters investigated may now be considered in sequence.

Habit. It must be remembered that while only the one *S. vulgaris* parent (B.11) was used, three different *S. maritima* parents were used to make the three F_1 families. It is obvious from the figures obtained in the F_2 families that a number of factors (3 or 4 at least) are involved in giving the habit characters we have scored as spreading, compact, prostrate, and ascending. In general terms, but not necessarily in the 3 : 1 Mendelian ratio sense, ascending is dominant over prostrate. When stock-plants A.5 and A.15, were used the spreading habit was dominant over the compact, when stock-plant A.2 was used the compact habit characterized the F_1 generation. The phenotypic ratios in F_2 families indicate complex genic interaction and it has not been found possible to explain the dominance of the compact habit in N. 91 and N. 100.

Barren shoots. The scoring can be summated as follows: All F_1 families were intermediate. The F_2 families show that segregation occurs.

	With barren over-wintering shoots as in *S. maritima*	Intermediate	No green over-wintering shoots as in *S. vulgaris*
From N. 40	41	74	53
,, N. 52	3	32	33

These figures suggest genetical segregation modified by cytoplasmic influences; the N. 40 families had *S. maritima* as ovule grand-parent; the N. 52 families had *S. vulgaris* as ovule grand-parent. The N. 42 F_2 (N. 93) gave the unexpected result that all 52 plants showed an intermediate development of the overwintering characters, possibly due to the influence of the cytoplasm of a different *S. maritima* ovule grand-parent.

Length of stems. In certain families dealt with in this paper the stem lengths (longest stem per plant) were measured for every plant. The data are arranged below in two tables. The first gives the maximum, minimum, and mean in cm., and the standard deviation from the mean for five families. In the second, measurements are arranged in classes, with 10 cm. as the class range.

Family	Maximum	Minimum	Mean	S.D.
N. 91	56	10	35	10.9
N. 92	60	22	39	8.7
N.100	65	25	48	11.2
	55	10	41	
N. 93	69	11	34	11.5
N. 88	58	14	54	13.7

Family	10–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90
N. 91	6	16	22	16	4	0	0	0
N. 92	0	18	38	26	9	0	0	0
N.100	0	1	2	5	3	1	0	0
	6	35	62	47	16	1	0	0
N. 93	9	15	12	14	4	0	0	0
N. 88	1	0	9	21	12	14	5	2

It is noteworthy that the maximum and mean are higher and the standard deviation is greater in the F_2 family (N. 88) with *S. vulgaris* as female (ovule) grandparent than in the F_2 families with *S. maritima* as female (ovule) grandparent. The absolute minimum value shows irregularity as between the families concerned. In the frequency table the mode in N. 88 is to the right of the modes for the other families, except for the small family N. 100 with whose mode it coincides. N. 93 is slightly bimodal. These results suggest some maternal influence on stem length additional to gene segregation.

Indumentum. The results for F_2 families may be summarized as follows :

All the F_1 families were uniform for medium indumentum.

	Dense	Medium	Few	Glabrous
From N. 40	52	60	18	45
,, N. 42	7	19	8	20
,, N. 52	8	43	14	28
Totals ...	67	122	40	93

These figures together with those previously published suggest that dense : medium + few : glabrous give what is to be interpreted

as a 1 : 2 : 1 ratio. Further the ratio of medium to few is 3 : 1, suggesting the action of a modifying factor which in the homozygous condition reduces medium to few. There are also probably factors present for modifying length of hairs in such interspecific crosses as those under consideration. F_1 families showed a very definite modification of the " medium " type of indumentum. Segregation for length of hairs occurred in F_2 families but was so complicated that attempted scorings were considered unreliable.

Leaves. The following summations of F_2 families give the facts :

	M	HM	MH	H	VH	HV	V
From N. 40	11	67	56	26	10	4	0
,, N. 42	2	15	6	13	5	10	3
,, N. 52	10	27	23	21	9	3	0

It is obvious that A.2 (which was one parent of N. 42) has caused very different F_2 ratios to appear from A.15 (one parent of N. 40) and A.5 (one parent of N. 52). A.2 with B.11 has given figures similar to those previously obtained when A.2 and B.1 were crossed together. It is probable that three or more factor pairs are involved.

The other two groups of families have given very similar ratios. A.15 and A.5 were both from the same Portland population and had essentially the same morphological characters, including linear leaves. Between A.15 (or A.5) and B.11 there must be at least 4 gene differences for leaf shape, since no *S. vulgaris* (B.11) foliage type appeared amongst 267 F_2 plants.

Inflorescence. The inflorescence in *Silene maritima* and *S. vulgaris* is typically a dichotomous cyme with a terminal flower to every branch. When, therefore, an inflorescence is fully developed it should have an odd number of flowers. The ideal series is 1—3—7—15—31—63—127—, any figure being obtained by multiplying the previous figure in the series by 2 and adding on 1. In the F_2 families here considered modes obviously occur at 3, 7, 15, and 31. A further analysis, however, shows that a difference occurs when *S. maritima* or *S. vulgaris* is used as the ovule grandparent. This suggests that *S. maritima* cytoplasm has a retarding influence upon inflorescence branching, although there is also a complicated segregation for this character.

The following table summarizes the F_2 families in which *S. maritima* and *S. vulgaris* was the maternal (ovule) grandparent respectively. If the class with 15 flowers be taken as a central class (it well represents an average F_1) then the figures can be summarized as follows :

maritima as ovule grandparent, total F_2 plants 234.

Less than 15 flowers 168 : 15 flowers 48 : more than 15 flowers 18 = approximately 9 : 3 : 1.

vulgaris as ovule grandparent, total F_2 plants 92.

Less than 15 flowers 28 : 15 flowers 39 : more than 15 flowers 25 = approximately 9 : 13 : 8.

Number of flowers	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
maritima ovule grand-parent	**3**	2	2	5	**62**	8	16	10	11	12	18	19	**48**	5	2	0
vulgaris ovule grand-parent	**2**	0	0	0	**21**	0	2	0	1	2	0	0	**39**	1	2	1

Number of flowers	19	20	21	22	23	26	27	28	29	30	31	32	33	43	52	53
maritima ovule grand-parent	1	0	0	1	2	1	1	1	1	0	0	1	1	0	0	0
vulgaris ovule grand-parent	0	2	1	2	4	0	0	0	1	1	**6**	1	1	1	1	1

Anthocyanin.

In vegetative parts : the two families N. 40 and N. 52, with medium anthocyanin, gave together as the sum from their F_2 families

50 much : 166 medium : 53 little : 0 none.

N. 42 had little anthocyanin and gave in F_2

19 much : 30 medium : 5 little : 0 none.

In calyx : the three F_1 families had all medium anthocyanin and the sum of their F_2 families gave 13 much : 201 medium : 98 little : 5 none. This is 312 anthocyanin : 5 no anthocyanin = 62·4 : 1.

This is surely a 63 : 1 ratio, probably based on three cumulative factors, which, however, are not necessarily of equal potentiality.

Blotch in corolla: N. 42 was derived from parents with anthocyanin blotch in the petals, it was uniform for and bred true to this character. In N. 40 segregation occurred in the ratio of 1 : 4. In two F_2 families derived from F_1 parents with blotches, segregation gave 2 : 1 and 1 : 1 ratios respectively. The other two F_2 families

had parents with no blotches; one bred true and the other segregated in a 3 : 7 ratio. In N.52 all plants had no blotch but segregation occurred in the F_2 families in a (total) 3 : 5 ratio. There is no doubt that genetic factors are involved, but that the action of these depends considerably on environmental conditions.

In anthers. All plants bred true to purple anthers except that N. 93 threw 3 yellow-green. All F_1 plants in N. 40 and N. 52 had purple filaments as had also the immediate parent of N. 93. The latter gave 31 : 11 and the F_2 families from the former together gave 126 : 34 = 3·7 : 1.

In stigmata and immature seeds. The following table gives the breeding results :

	Stigmata			Immature seeds		
	Purple		White	Purple		White
N. 40	3	:	27	30	:	0
N. 79	0	:	9	9	:	0
N. 91	4	:	57	57	:	2
N. 92	1	:	89	78	:	11
N.100	0	:	12	12	:	0
N. 42	20	:	27	47	:	0
N. 93	43	:	8	32	:	12
N. 52	5	:	1	6	:	0
N. 83	14	:	4	12	:	5
N. 78	11	:	0	7	:	3
N. 88	42	:	9	44	:	11

It is evident from the above figures and from the scorings already given for N. 17 that 2 or more complementary factors and 1 or more inhibiting factors occur for colour in stigmata. All the *S. maritima* grandparents had pink immature seeds, the *S. vulgaris* grandparent had white immature seeds. In all the F_1 families purple was dominant to white. The F_2 families show a ratio of 251 : 44 = 5·7 : 1. It should further be noted that the F_2 families derived from N.40 suggest " repulsion " between one or more factors for colour in the stigmata and one or more factors for colour in the immature seeds.

Calyx shape. When an *S. maritima* parent with inflated calyx was used this character was completely dominant in F_1 and a fairly high percentage of inflated calyces appeared in F_2. From analyses of the figures for calyx shape at present available we are uncertain of the numbers of factors involved.

Lobing of petals. The family N. 52 and its selfed offspring bred true to bilobing. N. 40 and N. 42 and their selfed offspring segregated, the F_2 families giving a ratio of 34·1 bilobed : 1 multilobed. It should be noted that multilobing is exceedingly rare in *S. vulgaris*. We have only found it twice in thousands of wild plants examined. In *S. maritima* it is more frequent, occurring in up to 14 per cent. of plants in some wild populations studied. The character is also very irregular in its appearance, sometimes a majority of the petals are

multilobed, more often only a small proportion on the whole plant. Bilobed and multilobed petals often occur in the same flower. Every plant showing any degree of multilobing is scored as multilobed.

All the parents and F_1 families had three-quarters lobing. The F_2 families summate as follows:

2 lobed $\frac{1}{3}$: 20 lobed $\frac{1}{2}$: 82 lobed $\frac{2}{3}$: 212 lobed $\frac{3}{4}$.

Petal lobing is to be more fully discussed in later papers in which further data from more extreme states will be given.

Corona. N. 42 had only F_1 scales (small scales) and its F_2 segregated for scales, bosses, and F_1 scales, the last in a large majority. A. 5 and A. 15 have evidently been responsible for the relatively large preponderance of bosses in the F_2 families of which they were the grandparents. The summation of the 7 F_2 families concerned gives 1 scales : 27 F_1 scales : 240 bosses.

Sex. The F_2 families summate as follows:

From	N. 40	89☿	:	18☿ and ♀	:	65♀
,,	N. 42	34☿	:	8☿ and ♀	:	11♀
,,	N. 52	20☿	:	31☿ and ♀	:	38♀

It is probable that sex in *Silene maritima* and *S. vulgaris* has a genetical basis of the FM type similar to that we have postulated for *Ranunculus acris* (see Journ. Genetics 31, 363 : 1935). In *Silene*, however, we have not so far found male and neuter plants. Genetical hermaphrodites probably have the constitution FFMM and genetical females FFmm. The intermediate and fluctuating types studied have, it is suggested, the constitution FFMm, but their phenotypic expression can range from full hermaphrodite to complete female and varies with many conditions which are only very slightly understood. Hence many plants scored as hermaphrodites or females, while phenotypically belonging to these groups, may genotypically be heterozygous (presumably for M since we have found no examples of males or neuters either in the wild or in bred families). Further work is in hand to test this hypothesis.

Mature capsules. The F_1 families all show a type of capsule intermediate between the *S. maritima* and *S. vulgaris* types. F_2 families (except one small one) show segregation of *S. vulgaris* but it was not possible to separate clearly *S. maritima* from F_1 type capsules and they are all scored as F_1 types.

Mature seeds. All the original crosses involved armadillo *S. maritima* and tubercled *S. vulgaris*. F_1 plants all had tubercled seeds and the F_2 families show a clear 3 : 1 segregation.

Summary.

1. The results of crossing three different plants of *Silene maritima* with one plant of *S. vulgaris* are given and analyzed.

2. Two main factors and at least one modifying factor are needed to account for the indumentum types found and their genetical behaviour.

3. At least 4 gene differences are needed to account for the leaf shapes investigated.

4. The number of flowers per inflorescence is controlled by genes interacting with cytoplasmic and environmental factors. Length of stems also appears to show maternal influence additional to gene segregation.

5. Anthocyanin development is controlled by complementary and inhibiting genes which can behave independently in their action on different organs but show some linkage and "repulsion."

6. It is suggested that sex has an FM basis in which FFMM plants are full hermaphrodites, FFmm plants are females, and FFMm plants show fluctuating intersexualism.

7. Armadillo seeds are clearly recessive to tubercled.

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XLIII—MELANESIAN PLANTS: II*.

B. L. Burtt.

Garcinia (Sect. **Discostigma**) **scaphopetala** *B. L. Burtt* (Guttiferae); species nova *G. Warrenii* F. v. Muell. et *G. umbonatae* Lauterb. affinis, ab illa phalangibus stamineis ad petala vix adhaerentibus, ab hac floribus maioribus, sepalis subaequalibus exterioribus haud umbonatis differt.

Arbor glabra, circiter 10·5 m. alta, ramulis leviter angulatis. *Folia* opposita, petiolata; petiolus 5 mm. longus, supra leviter sulcatus; lamina elliptica, 11–20 cm. longa et 5–8 cm. lata, apice breviter et obtuse acuminata, basi rotundata, marginibus integris leviter revolutis; nervi laterales numerosi, leviter ascendentes, nervo intramarginali inconspicuo coniuncti. *Flores* ♂ tantum visi, in fasciculos axillares paucifloros dispositi. *Pedicelli* 5–8 mm. longi, basi vel medio vel apice bracteolis duabus instructi; bracteolae oppositae, 2 mm. longae, acutae, basi connatae. *Sepala* 4, late triangularia, 3–4 mm. longa et lata, apice obtusa. *Petala* 4, lamina suborbiculari profunde scaphiformi leviter unguiculata, 5 mm. longa et 6 mm. lata, apice rotundata. *Stamina* numerosa, in phalanges 4 ramosas petalis oppositas coniuncta. *Pistillum* inchoatum, ovario nullo, stylo 6 mm. longo, stigmate magno discoideo 3 mm. diametro.

Solomon Islands. Bougainville Island, Maisua, "a tree about 35 ft. in height," Jan. 1933, *Waterhouse* B. 825 (Y. 183).

Vernacular names—*sigu* (Siwai), *tabutabun* (New Britain), *pedeposa* (Buka).

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*Continued from K.B. 1935, 306.

The New Guinea species of *Garcinia* were revised by Lauterbach (in Engl. Bot. Jahrb. **58**, 15 : 1922) and more recently the genus as a whole has been treated by Engler (in Engl. & Prantl, Nat. Pflanzenfam. 2 Aufl. **21**, 211 : 1925). *G. scaphopetala* belongs to the section *Discostigma* in the classification adopted by these authors. One of its close allies, *G. umbonata*, is endemic to New Guinea, while *G. Warrenii* was described from Queensland but has since been recorded from New Guinea as well.

Kingiodendron micranthum *B. L. Burtt* [Leguminosae—Caesalpineae] ; species nova a *K. alternifolio* (Elmer) Merrill et Rolfe inflorescentia maiore et glabra facile distinguitur.

Arbor circiter 18–21 m. alta. *Folia* pinnata, foliolis 3–4 alternis ; petiolus 1–2·5 cm. longus, basi incrassatus et rugosus, glaber ; foliola inter se 1·5–2·5 cm. distantia, petiolulis 7 mm. longis incrassatis et rugosis supra canaliculatis instructa ; lamina plus minusve elliptica, levissime falcata, 9–20 cm. (plerumque 10–12 cm.) longa et 5–9 cm. (plerumque 6–8 cm.) lata, apice breviter acuminata, basi subito angustata vel fere rotundata, pellucido-punctata, glabra ; costa supra leviter impressa, subtus prominens, nervis lateralibus 6–8 ut venulis utrinque prominulis. *Inflorescentia* axillaris, axe circiter 2·5 cm. longo racemos 3–8 usque ad 12 cm. longos simplices graciles flexuosos gerente, glabra. *Flores* parvi, bracteis minutis suffulti ; alabastra orbicularia, 0·5 mm. diametro. *Pedicelli* 1·5 mm. longi, apice bracteolis 2 instructi. *Bracteolae* oppositae, ad calycem appressae, 0·5 mm. longae, acutae. *Sepala* 5, fere 2 mm. longa et 1·5 mm. lata, apice rotundata, marginibus ciliata, pellucido-punctata. *Petala* 0. *Stamina* 10 ; filamenta 1·75 mm. longa, basi pilosa ; antherae minimae, dorsifixae. *Pistillum* 0·75 mm. longum, parce pubescens, stylo brevi et crasso. *Fructus* ignotus.

Solomon Islands. Bougainville Island, Siwai, " a tree about 60–70 ft. high, somewhat resembles *Afzelia*, stem buttressed at the base, good timber, near water and streams," Dec. 1932, *Waterhouse* B. 812 (Y. 172).

Vernacular names—*panorug* (Siwai), *kurinibangara* (Buka).

Kingiodendron platycarpum *B. L. Burtt* [Leguminosae–Caesalpineae] ; species nova praecedenti, *K. micrantho* B. L. Burtt, affinis, sed ob foliola plerumque longiora et inflorescentiam pubescentem satis recedit.

Arbor usque ad 15 m. alta, ramulis subglabris griseis lenticellosis. *Folia* pinnata, foliolis 3–4 alternis ; petiolus 1·5–4 cm. longus, ut ramuli griseus, basi incrassatus brunneus rugosus. *Foliola* inter se 2–3·5 cm. distantia ; petioluli circiter 6 mm., parti incrassatae petioli similes ; lamina elliptico-lanceolata, leviter falcata, 10–20 cm. longa, 4–6 cm. lata, apicem subobtusum versus sensim acuminata, basin versus abrupte angustata vel fere rotundata, glabra, pellucido-punctata ; costa supra plana subtus prominens, nervis lateralibus

circiter 9, venulis vix prominentioribus et ciscum reticulum laxum formantibus. *Inflorescentia* ut in *K. micrantho* sed breviter et dense pubescens. *Pedicelli* 1 mm. longi, pubescens, bractea parva suffulti, apice bracteolas 2 vix ad medios sepalos attingentes gerentes. *Sepala* 5, suborbicularia, circiter 1·25 mm. longa et 1 mm. lata, pellucido-punctata, conspicue ciliata. *Petala* 0. *Stamina* 10, 1 mm. longa; antherae vix 0·5 mm. longae, dorsifixae; filamenta ad apicem angustata dimidio inferiore pilosa. *Ovarium* hirsutum, 1 mm. altum stylo crasso et stigmate incluso. *Fructus* a lateribus in discum valde compressus, circiter 5 cm. longus et 5 cm. altus, semine uno magno plano.

Fiji Islands. Viti Levu, Raki Mountains, "middle sized tree 35–40 ft. in height, not common," March 1878, *Horne* 483 (flowers; type). Vanua Levu, district of Bua, "large tree 40–50 ft. in dry parts near streams, wood hard and liked by the Fijians for many purposes," Sept. 1878, *Horne* 1121 (fruit).

Vernacular name—*moivei*.

The genus *Kingiodendron* was described by Harms (in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 1, 194 : 1897) to receive *Hardwickia pinnata* Roxb., a native of the Western Ghats of southern India, which is distinguished from *Hardwickia* Roxb. *sensu stricto* (the only species of which is *H. binata* Roxb.) by its pinnate and pellucid-punctate leaves, dense inflorescence and small stigma. In 1909 Merrill and Rolfe (in Philipp. Journ. Sci. Bot. 4, 267 : 1909) transferred to *Kingiodendron* a Philippine species, *K. alternifolium* (Elmer) Merrill et Rolfe, which Elmer had previously placed first in *Cynometra* and then in *Hardwickia*.

The description of *K. micranthum* and *K. platycarpum* results in a considerable extension of the eastward range of the genus, a matter of particular interest because its closest ally appears to be the American genus *Prioria* Griseb., the single species of which, *P. Copaifera* Griseb., is found in the West Indies (Jamaica and Trinidad), Panama and Colombia.

In general appearance *P. Copaifera* closely resembles *Kingiodendron platycarpum*, but is distinguished from it and the other species of *Kingiodendron* by its opposite leaflets and connate bracteoles and by the presence of a prolongation of the anther-connective. The pellucid-punctate leaflets and sepals and the very small petal-less flowers, as well as the inflorescence, the branches of which are simple spike-like racemes, indicate a close affinity between the two genera. The shape of the legume of *Prioria* also agrees closely with that of *K. platycarpum*, and it is perhaps significant that the latter species is closest to *Prioria* both geographically and morphologically.

The legume of *K. micranthum* is not yet known, but those of the three other species show rather more diversity than do other characters in this genus and, when present, provide the easiest

means of distinguishing the species. The legume of *K. pinnatum* is obovate, 3–4 cm. long and 2–3 cm. wide, laterally compressed, at least at the base below the seed and at the margins. In *K. alternifolium* the legume is about the same size, but more woody and only slightly (and evenly) compressed. In *K. platycarpum* the pod is very strongly compressed, about 5 cm. long and of the same depth, suborbicular in side view.

Spiraeopsis celebica (*Bl.*) *Miq.*? [Cunoniaceae]; Miquel, Fl. Ind. Bat. **1**, pt. 1, 719 (1856). *Cunonia celebica* Bl. Bijdr. 868 (1826). ? *Spiraeopsis philippinensis* Elmer, Leafl. Philipp. Bot. **8**, 2826 (1915).

Solomon Islands. Bougainville Island, Paramoni, Maisua, "a tree about 30–40 ft. high, 5–6 ft. in circumference," Sept. 1932, *Waterhouse* B. 738 (Y. 86).

Vernacular name—*donai*.

I have been unable to decide definitely whether the Bougainville plant is conspecific with *S. celebica* or not, there being very little material of the latter available for comparison. I have not seen the type specimen of *Cunonia celebica* Bl., which is the basis of Miquel's combination, but Koorders (Suppl. Fl. N.O. Celebes, **1**, pt. 1. t. 7a–7b : 1918) has figured material which he collected from the same area, and duplicates of some of his specimens are in the Kew herbarium. There seems little doubt that Koorders identified his plant correctly, the only difference being, as he pointed out, that he found the plant to be monoecious whereas it had previously been described as dioecious. All the herbarium specimens seen have been entirely male or entirely female.

Specimens from the Philippine Islands have also been referred to *S. celebica* (Merrill and Rolfe in Philipp. Jour. Sci. Bot. **3**, 101 : 1908), but Elmer (Leafl. Philipp. Bot. **8**, 2826 : 1915) has since described *S. philippinensis* to which all the Philippine material must be referred, whether considered conspecific with *S. celebica* or not. The chief discrepancy between the two species is in the form of the stipules ; in true *S. celebica*, according to both Miquel and Koorders, they are dentate or serrate and Koorders figures serrate ones from a young plant : in *S. philippinensis* they are quite entire. In addition the indumentum of the undersurface of the leaves is denser in the Philippine specimens.

Engler (Engl. & Prantl, Natürl. Pflanzenfam. 2 Aufl. **18A**, 246 : 1930) regarded *S. philippinensis* as a synonym of *S. celebica*, but called attention in his key to another plant from the Philippines which he distinguished, without giving it a name, by the presence of stipels. This character is, however, of no taxonomic value, for I find stipels on one of Koorders's specimens from Celebes, on one specimen from the Philippines and on some leaves of Waterhouse's Bougainville plant.

In the shape of the stipules the Bougainville specimens agree with *S. philippinensis*, but the leaves are larger and have only a thin indumentum on the lower surface; these differences might prove to be correlated with a damper and more shaded habitat. I have not seen any stipules of true *S. celebica* and cannot say whether the serrate form is normal or confined to young plants and coppice shoots. Under the circumstances I tentatively refer all the specimens to *S. celebica*, but when further material is available it may well be found that two or three separate species are represented.

Canthium cymigerum (*Valeton*) *B. L. Burtt* [Rubiaceae–Vanguerieae] comb. nov.

Plectronia cymigera Valeton in Engl. Bot. Jahrb. **69**, 54 (1927).

N. E. New Guinea. In den Wäldern des Maboro, Mai 1909, *Schlechter* 17513 (type).

Solomon Islands. Bougainville Island, Siwai, "tree 30–60 ft., the larger trees with buttress base; timber close-grained and heavy; grated bark used in *kupi*—a marriage custom," Dec. 1932, *Waterhouse* Y. 163.

Cyrtandra filibracteata *B. L. Burtt* [Gesneriaceae–Cyrtandreae]; species nova nulli arcte affinis. Verisimiliter prope *C. coleoidem* Seem. et *C. labiosam* A. Gray ponenda, sed bracteis filiformibus persistentibus et floribus unisexualibus inter alia valde recedit.

Frutex vel arbor parva, ut videtur dioica. *Ramuli* grisei, levissime pubescentes, siccitate longitudinaliter rugosi, internodiis 2·5–4 cm. longis. *Folia* opposita, utraque paris bene evoluta sed inaequalia; petiolus 0·5–2 cm. longus, supra sulcatus, primum brunneo-pilosus, glabrescens; lamina oblanceolata, vel minor paris plus minusve elliptica et inaequilateralis, circiter 10–22 cm. longa et 3·5–7·5 cm. lata, apice acuminata, ad basin angustata, marginibus praecipue supra mediam laminam dentato-crenulatis, supra primum tenuiter pilosa, subtus primum brunneo-tomentella, utrinque glabrescens; costa subtus prominens nervis lateralibus ascendentibus utrinsecus 12–16. *Bracteae* filiformes in ramulis brevissimis editae, aliae steriles, aliae floriferae, fasciculum formantes, ad 1·8 cm. longae, supra sulcatae, ad basin versus sparse pubescentes, ad apicem saepe glabrescentes. *Flores* unisexuales. *Pedicellus* 5 mm. longus, pubescens. *Calyx* bilabiatus vel subspathaceus, 5 mm. longus, tenuis, extra breviter pubescens. *Corolla* 1·7–2 cm. longa, tubo leviter curvato, bilabiata; labium inferius e lobo uno lanceolato 7 mm. longo; labium superius 4-lobatum, lobis 2 inferioribus obtusis margine inferiore 7 mm. longa, superiore 2 mm. longa, 2 superioribus acutis 2 mm. longis sinu 1 mm. profundo seiunctis. *Staminodia* in typo nulla, in specimine Guppyano staminodia 5 parva praesentia. *Ovarium* 0·5 cm. longum, glabrum, in stylo 1·5 cm. longo productum. *Stigma* capitatum leviter bilobatum. *Fructus* oblongus vel ovoideus, 1–1·3 cm. longus, 3–5 mm. crassus.

Solomon Islands. *Guppy* s.n. (comm. 1885). Bougainville Island, Siwai, " shrub or small tree," July 1930, *Waterhouse* B. 132 (type) ; " a small tree," *Waterhouse* Y. 134.

Vernacular names—*tipaka, pokotipa.*

Guppy's specimen, which was examined by the late Dr. O. Stapf whose notes I have had the advantage of using, differs from those collected by Waterhouse, in having staminodes and in the shorter, more ovoid fruit : it is very incomplete and no leaves are present, but if not identical, it is at least very closely allied to the Bougainville plant.

Cyrtandra filibracteata is referable to the section *Polynesieae* in the classification proposed by C. B. Clarke (in A. and C. De Candolle, Monogr. Phan. **5,** pt. 1, 201 : 1883) : it does not, however, fit exactly into any of the seven groups into which Clarke classified the species of this section. *C. filibracteata* has its closest affinity with *C. coleoides* Seem. (Fl. Vit. 181 and t. 40) and *C. labiosa* A. Gray (in Proc. Amer. Acad. **6,** 40 : 1862). The former is a native of Fiji and agrees with *C. filibracteata* in having both leaves of each pair well, but rather unequally, developed. The flowers of *S. coleoides* are mainly borne on the old wood, but the bracts are apparently caducous, there being none present on any of the material examined, and the peduncles are 1–3-flowered. The calyx is much the same as in *C. filibracteata* but the corolla has the three lower lobes more or less equal and ovate-triangular, the upper two smaller and with a rather shallow sinus between them. This contrasts sharply with the corolla of *C. filibracteata*, which has a very narrow lower median lobe and an upper lip formed of the two obtuse lower laterals and the more acute upper laterals. In this respect it agrees more closely with *C. labiosa* A. Gray, a species native to Samoa and still very imperfectly known, which differs from *C. coleoides* Seem. in having the lower median lobe longer and narrower than the lower laterals.

The New Guinea *Gesneriaceae* have been revised by Schlechter (in Engl. Bot. Jahrb. **58,** 255 : 1923), who has proposed a completely new classification of the species of *Cyrtandra* found in that region. If we follow this, *C. filibracteata* must be referred to the section *Macrocyrtandra* of the subgenus *Glossophora.* I cannot, however, find any close affinity for it in this section, nor indeed among any of the New Guinea or Malayan species.

Attention is drawn in the diagnosis to the fact that *C. filibracteata* has unisexual flowers. This is a character which has been used by Lauterbach (in Nova Guinea, **8,** 331 and t. 66 : 1910) as the basis for the establishment of a distinct genus, *Cyrtandropsis.* In the single species of this genus, *Cyrtandropsis monoica*, Lauterbach reported finding male and female flowers in the same inflorescence, and from his short note following the generic description it is evident that he regarded the unisexual nature of the flowers as the main, and indeed the only, basis for the genus.

Schlechter, in his revision of the New Guinea *Gesneriaceae*, added fifteen more species to *Cyrtandropsis*, thirteen being described for the first time, the other two being transferred from *Cyrtandra* : all these were found to be dioecious. I have seen only a few of these species, and cannot, therefore, say whether they are truly allied to one another, or merely agree in having unisexual flowers.

The only species of *Cyrtandropsis* so far described from outside New Guinea is the Hawaiian *C. kaululuensis* Hochreutiner (in Candollea, **5**, 215 : 1934). Hochreutiner, although he retained *Cyrtandropsis* as a distinct genus, called attention to its discontinuous distribution, and suggested that this could only be explained by the assumption that the unisexual condition of the flowers had arisen within the genus *Cyrtandra* on more than one occasion.

I have compared *Cyrtandra filibracteata* with those species of *Cyrtandropsis* which are represented in the Kew herbarium, and fail to find any evidence of a close affinity. Nor does it agree at all closely with the description of *Cyrtandropsis finisterrae* Schlechter, to which it comes closest in the key. None of these species has the conspicuously bilabiate corolla or persistent, filiform bracts of *Cyrtandra filibracteata*, and *Cyrtandropsis finisterrae* is the only one to have both leaves of each pair well-developed. This being so it is undesirable to separate *Cyrtandra filibracteata* from its probable allies in *Cyrtandra* and to describe it as a species of *Cyrtandropsis* solely on account of its unisexual flowers ; furthermore, it is very unlikely that *Cyrtandropsis* will eventually be retained as a distinct genus unless other supplementary characters are found.

Finschia Waterhousiana *B. L. Burtt* [Proteaceae–Grevilleae] ; species nova a *F. rufa* Warb. foliis adultis utrinque costa excepta glabris, ovario et gynophoro glabro differt. Ab etiam affini *F. chloroxantha* Diels foliis minoribus nervo intramarginali minus conspicuo basin versus abruptius angustatis, perianthio et gynophoro et stylo longioribus facile distinguenda.

Arbor fere usque ad 30 m. alta. *Ramuli* breviter et appresse rufo-pubescentes, demum glabrescentes. *Folia* alterna, petiolata ; petiolus circiter 2 cm. longus, supra planus, subtus obtuse carinatus, leviter pubescens ; lamina elliptica, circiter 15–22 cm. longa et 6·5–10 cm. lata (apice irrupto non viso), basi cuneata, marginibus undulata, utrinque primum sparse rufo-pubescens, demum costa excepta glabrescens. *Inflorescentia* racemosa, in ramis vetustioribus axillaris, circiter 15–20 cm. longa, axe breviter rufo-pubescente, floribus binatis ebracteatis. *Pedicellus* 8 mm. longus, ut axis breviter rufo-pubescens, apice incrassatus, receptaculo leviter obliquo. *Perianthium* extra breviter rufo-pubescens ; tubus 8 mm. longus, uno latere scissus, apice in limbo globoso e lobis 4 ellipticis 2 mm. longis circum stigma cohaerentibus dilatatus. *Stamina* 4 in lobis perianthii sessilia, antheris 1·25 mm. longis. *Discus* hippocrepiformis, vix 1 mm. altus, gynophorum haud includens, glaber.

Gynophorum 4 mm. longum, glabrum. *Ovarium* parvum, 1 mm. longum et latum, ovulis 2 pendulis instructum. *Stylus* 1 cm. longus, ut gynophorum et ovarium minute papillosus, stigmate conico coronatus. *Fructus* ignotus.

Solomon Islands. Siwai, Bougainville, Jan. 1933, *Waterhouse* Y. 187 " Specimen from a tree 40–50 ft., but some almost double that height. A handsome golden flower and useful nicely grained timber. Fruit edible. Apparently not known in New Britain."

Vernacular names—*togtua, kanokele.*

Finschia Waterhousiana is the third species of this genus to be discovered, the other two, *F. rufa* Warb. and *F. chloroxantha* Diels being natives of New Guinea. *Finschia* may be distinguished from *Kermadecia* by its long gynophore and horse-shoe-shaped disc. It has the facies of some species of *Helicia*, which differs, however, in having anthers on short filaments inserted below the lamina, a sessile ovary and either 4 distinct hypogynous glands or an annular or cupular disc.

XLIV—MISCELLANEOUS NOTES.

Trees and Shrubs of Kenya Colony.*—This is a revision and enlargement of Mr. Battiscombe's useful book on the common trees and woody plants of the colony, published by the Crown Agents for the Colonies in 1926, and now out of print.

A large number of additional species collected by members of the Forest Department in the 10 years interval have been added, although some of the entries can hardly claim to be either trees or shrubs, such as *Cleome strigosa* Oliv. and *Bidens pilosa* L.

It is much to be regretted that, owing to financial stringency, it has not be possible to include the excellent photographs published in the first edition. One presumes that if the original blocks were available their inclusion would not have added very much to production costs.

A useful feature of the new book is the addition of many more vernacular names, which are arranged in ten groups of allied native tribes, and of an introductory chapter describing the main forest-types of Kenya.

The description of the additional species, etc., is mainly the work of Mr. I. R. Dale, Assistant Conservator of Forests.

J. Hutchinson.

Forest Flora of Southern Nigeria†.—This book is not quite what one might expect from its title, for it is mainly devoted to field notes on Mr. Kennedy's own collection. As such it is a valuable contribution to our knowledge of the forest flora of the region,

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* "Trees and Shrubs of Kenya Colony." Nairobi, Government Printer, 1936. Pp. 201. Price 5*s.*

† By J. D. Kennedy, M.B.E., Dip. For. (Edinb.), Sylviculturist, Nigerian Forest Services. Lagos; Government Printer. 1936. Price 10*s.* 0*d.* Net.

about which we have had little first hand information up to the present. It will be a useful supplement to the botanical information provided by the "Flora of West Tropical Africa" and is fortunately arranged according to the same classification.

Mr. Kennedy has collected a considerable amount of information about the species he has met with in the field, or rather forest, giving native names where known, which are also separately indexed at the end of the book. It is particularly interesting to the writer of this note to learn something of the habits of species which he knows almost entirely from herbarium specimens.

Mr. Kennedy's field numbers would have been better quoted immediately after the name of the species and not on a separate line at the end of the description, particularly when they come at the top of a page, as on pp. 28 and 29, where the number might be thought to belong to the species below.

Except for a few misprints and the unfortunate insertion of the word "Monocotyledones" under the *Gymnospermae* on p. 7, we have no fault to find with this book which is heartily welcomed, and it is to be hoped that Mr. Kennedy's example will be followed by other foresters in Africa.

J. HUTCHINSON.

Botanical Magazine.—Part 3 of vol. 159 was published on July 31st and contains the following plant portraits and descriptions:—

Rhododendron rhabdotum Balf. f et Cooper (t. 9447), a native of Bhutan; *Penstemon ambiguus* Torrey (t. 9448), a very distinct phlox-like species found in the S.W. United States and Mexico; *Sarcococca humilis* Stapf (t. 9449), a useful evergreen shrub, first found by Augustine Henry in W. Hupeh, E. Szechwan and Yunnan; *Lavatera assurgentiflora* Kellogg (t. 9450), from the islands off the coast of California; *Primula Wigramiana* W. W. Sm. (t. 9451), a beautiful white *Soldanella*-like *Primula* from the high mountains of Nepal; *Sutera grandiflora* (Galpin) Hiern (t. 9452), a useful mauve-flowered garden plant native of the Eastern Transvaal; *Eria amica* Reichb. f. (t. 9453), distributed from N. E. India through Yunnan to Formosa; *Cotoneaster lactea* W. W. Sm. (t. 9454), a recent introduction from Yunnan by George Forrest; *Pelargonium Andrewsii* (Sweet) G. Don. (t. 9455), from the Cape, remarkable for its polymorphic leaves; *Gaultheria codonantha* Airy Shaw (t. 9456), a striking green-flowered shrub endemic in Upper Assam; and *Leucocoryne ixioides* (Hook.) Lindley (t. 9457), the beautiful mauve-blue "lily" from S. Chile.

Mushrooms.*—Although written primarily for American readers, this little book should prove valuable to beginners every-

* "The Mushroom Handbook." By Louis C. C. Krieger. Macmillan & Co., London and New York, 1936. Pp. xiv + 530, 125 uncoloured illustrations in the text, 32 coloured plates. Price 15s. net.

where as an introduction to the study of the larger fungi. The first half of the volume contains information as to the classification of the larger fungi, the conditions under which they grow, life histories, economic importance, etc., all written in a popular and readable style. An excellent feature is a guide to the literature on the fungi, so that those who wish to go beyond the superficial recognition of common edible and poisonous species are shown where to pursue their studies. There are also notes as to methods of collection and preservation for the herbarium, and the characters to be noted in writing descriptions. The latter part of the book consists of detailed descriptions of species. Some of these are American species or varieties which do not occur in Britain, but many are common to both Europe and North America. The author's use of the word "mushroom" for the larger fungi in general is at first a little confusing to English readers. The black-and-white illustrations are good and the coloured plates are excellent reproductions of the author's beautiful drawings. The book is of a useful size for field work, and the typography excellent ; there appear to be very few errors.

E. M. WAKEFIELD.

Empire Minor Forest Products*.—This useful publication has been prepared as the result of a resolution passed at the Imperial Conference of 1930. Its compilation has been carried out by the Imperial Economic Committee in consultation with the Forest Departments of the Empire, the Imperial Institute, and Kew. The term minor forest product is understood to signify any product of the natural forest other than timber and its derivatives. Between five and six hundred products from thirty-seven Empire countries are listed and more than four hundred bibliographical references are given. The products are arranged in the following groups, each group being preceded by short introductory remarks :—drugs and spices, dyes, essential oils, fibres, gums and resins, oils and oil seeds, tanning materials, and miscellaneous.

The information supplied for each product is arranged in five columns. It includes the common name of each commodity, the botanical name of the plant yielding it, the country of origin and its relative importance in that country, export figures (where known) and references to literature. The full indexes supplied will no doubt render the work easy of reference. It should prove useful to merchants, forest officers and administrators by supplying information in a handy form, and may also be helpful to forest officers of the Empire when considering the economic possibilities of little known forest products.

F. N. HOWES.

* "An Index of the Minor Forest Products of the British Empire". Printed and published for the Imperial Economic Committee by His Majesty's Stationery Office, London, 1936. Pp. 116. Price 5s. 0d. net. (5s. 3d. post free).

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